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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 919,340	07 30 2001	Jae-Hak Kim	4591-183	2739

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EXAMINER

ERDEM, FAZLI

ART UNIT PAPER NUMBER

2826

DATE MAILED: 12 20 2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/919,340

Applicant(s)

KIM ET AL.

Examiner

Fazli Erdem

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133)
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 September 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6 is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.

Attachments:

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-945)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-101)
- 6) ☐ Other _____

DETAILED ACTION

Allowable Subject Matter

1. Claim 6 is allowed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 7-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (6,287,955) in view of Takeishi (6,376,048) further in view of Seta et al. (6,352,931)

Regarding Claims 7-15, Wang et al. and Takeishi et al. combination do not show an organic silicon oxide layer. However, Seta et al. disclose a manufacturing method of semiconductor devices by using dry etching technology including the usage of organic silicon dioxide layer.

Regarding Claim 7, In Figs 1-3 Wang et al. disclose all the claimed subject matter including, inorganic low-k dielectric, organic low-k dielectric, Copper filled metal plug.

Wang et al. fail to specify organic and inorganic dielectric layers as organic and inorganic dielectric silicon oxide layers and substrate. However, in Figs. 5 Takeishi discloses a lamination/wiring structure where he discloses substrate 11 conductive regions on it, inorganic and organic silicon oxide layers.

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Regarding Claim 8, both Wang et al. and Takeishi show the manufacturing steps of formation of contact plug and interconnection

Regarding Claim 9, in Figs 1-3 of Wang et al. the conductive plug is made out of copper.

Regarding Claim 10 and 11, Takeishi shows that the organic layer could be made out of fluorocarbon based organic oxide layer and it's deposited with Chemical Vapor Deposition.

It would have been obvious to one of having ordinary skill in the art to include a substrate and dielectric layers as silicon oxide layers in Wang et al. as taught by Takeishi and Seta et al. because such structure would provide a better performance and insulation.

3. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takase et al. (6,051,508) in view of Wang et al. (6,287,955) further in view of Seta et al. (6,352,931)

Regarding Claims 1-4, Takase et al. and Wang et al. combination do not teach the application of organic silicon dioxide layer. However, Seta et al. disclose a manufacturing method of semiconductor devices by using dry etching technology where the application of organic silicon dioxide layer is disclosed.

Regarding Claim 1, in Figs. 3A-3G, Takase et al show all the claimed subject matter including the deposition of organic and inorganic oxide layers on a substrate and forming trench with HF etching. Takase et al. fail to explaining the low dielectric constant properties of the oxide layers and fail to disclose the trench formation in detail. However, Wang et al. show a fabrication method of integrated circuits with multiple low dielectric-constant intermetal

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dielectrics where the etching of trench and explanation of low dielectric properties of the insulating layers explained.

Regarding Claim 2, Fig. 3G of Takase et al. show the filling of trench with Al and the usage technique of Chemical Vapor Deposition.

Regarding Claims 3 and 4, in preceding step-by-step figures of 2-5, Wang et al. show the formation of resist processing and formation of contact hole. Figs. 3 of Takase et al. also show the formation of contact hole. Both Wang et al. and Takase et al. disclose the ashing process.

It would have been obvious to one of having ordinary skill in the art to provide low dielectric characteristics of dielectric layers and the method of etching these layers along with the application of organic silicon oxide layer in order to provide an integrated circuit having low parasitic capacitance.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takase et al. (6,051,508) in view of Wang et al. (6,287,955) further in further in view of Seta et al. (6,352,931) further in view of view of Takeishi (6,370,048)

In combination Takase et al., Wang et al. and Seta et al. disclose all the claimed subject matter except they fail to specify the thickness of the organic insulating film. However, in Fig. 1A, Takeishi discloses the thickness of the organic insulating film 4 to be between 0.05- 2.0 microns.

It would have been obvious to one of having ordinary skill in the art to provide organic insulation layer of required thickness in Takase et al., Wang et al. and Seta et al. combination as taught by Takeishi for device geometry purposes.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (703) 305-3868. The examiner can normally be reached on M - F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

FE
December 13, 2002


NATHAN FLYNN
SUPERVISOR
TELEPHONE